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| 09/912,558                             | 07/26/2001  | Ronald A. Weimer     | M4065.0319/P319-A   | 5990             |
| 24998                                  | 7590        | 05/03/2005           | EXAMINER            |                  |
| DICKSTEIN SHAPIRO MORIN & OSHINSKY LLP |             |                      | KIELIN, ERIK J      |                  |
| 2101 L Street, NW                      |             |                      | ART UNIT            |                  |
| Washington, DC 20037                   |             |                      | PAPER NUMBER        |                  |
|  |             |                      | 2813                |                  |

DATE MAILED: 05/03/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

|                              |                               |                               |  |
|------------------------------|-------------------------------|-------------------------------|--|
| <b>Office Action Summary</b> | Application No.<br>09/912,558 | Applicant(s)<br>WEIMER ET AL. |  |
|                              | Examiner<br>Erik Kielin       | Art Unit<br>2813              |  |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 February 2005.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 13, 14, 16, 17, 42 and 44-48 is/are pending in the application.  
     4a) Of the above claim(s) 44-48 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 13, 14, 16, 17 and 42 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
     Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
     Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
     a) ☐ All    b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

### DETAILED ACTION

This action responds to the Amendment filed 11 February 2005.

#### *Election/Restrictions*

1. Newly submitted claims 44-48 are directed to an invention that is independent or distinct from the invention originally claimed for the following reasons:

New claims are drawn to the **non-elected invention of Group II** as indicated in the Restriction filed 19 December 2003. **Applicant elected the invention of Group I**, as indicated in Applicant's Response filed 5 January 2004. Accordingly it is unclear why Applicant is now introducing claims drawn to a non-elected invention.

Since applicant has received an action on the merits for the originally presented invention, this invention has been constructively elected by original presentation for prosecution on the merits. Accordingly, claims 44-48 are withdrawn from consideration as being directed to an invention already non-elected by Applicant. See 37 CFR 1.142(b) and MPEP § 821.03.

#### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

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3. Claims 13 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 5,891,809 (**Chau** et al.) in view of US 5,618,349 (**Yuuki**).

Regarding independent claim 13, **Chau** discloses a method of forming a gate dielectric layer on a substrate comprising the steps of

depositing a dielectric film **115, 505** over an active region of a semiconductor substrate **500** to form part of a gate of a transistor (Figs. 1, 2, and 5; paragraph bridging cols. 3-4);

subjecting the dielectric film **505** to a densifying treatment **120** to stabilize said dielectric film by heating the semiconductor substrate, said densification and stabilization results from replacement of residual chlorine by oxygen (Figs. 1, 2, and 5; col. 4, lines 42-52); and

subjecting the stabilized dielectric film **505** to a wet oxidation with steam process **125** in a rapid thermal process chamber (because the processes are fast, the furnace is a "rapid thermal process chamber") to raise the oxygen content of said dielectric film, using a pyrogenic steam formation method using 2 liters per minute hydrogen and 5 liters per minute oxygen at a temperature greater than about 450 °C, in one embodiment to 750 °C --as further limited by instant claim 14 (Figs. 1, 2, and 5; paragraph bridging cols. 4 and 5). Given the stoichiometry of the reaction  $2 \text{H}_2 + \text{O}_2 \rightarrow 2 \text{H}_2\text{O}$ , and that all gases have the same number of moles per liter at the same temperature (e.g. 22.4 liters per mole at 25 °C and 1 atm pressure), the 2 liters per minute hydrogen reacts with 1 liters per minute of oxygen to produce 2 liters per minute of steam in a total flow of 2 liters per minute steam plus 4 liters per minute remaining of oxygen. This means that there exists a ratio of steam in the gas mixture is 2/6 or 0.3 which falls exactly in the center of the claimed range of 0.1 to 0.5.

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It is seen to be inherent that steam is “carried to the chamber” because **Chau** states that a pyrogenic steam is created (Chau, col. 4, lines 55-56) and **Yuuki** teaches that it is known in the art the pyrogenic steam involves the used of a burner **14** (Fig. 3; col. 1, lines 30-33) to produce the steam which is subsequently carried to the chamber **10**. Further in this regard, the method by which the water for the wet oxidizing atmosphere is not critical according to Applicant's admissions in the instant specification. Rather, Applicant's specification teaches away from such unexpected results. Applicant teaches,

“One of several techniques can be used to provide steam to a vicinity of the insulating film. Such techniques include using a **bubbled water vapor system**, a **pyrogenic system** or a **catalytic system**, or **generating steam in the chamber *in situ***.” (Emphasis added. See instant specification, page 3, lines 13-17.)

In other words, any of the presently notoriously well-known means to form the steam, which are specifically used in the art for oxidation, could be used, according to Applicant.

**Chau** is silent to the pressure used during the oxidation.

**Yuuki** teaches that pyrogenic oxidation of silicon substrates is carried out at atmospheric pressure (Yuuki, col. 5, lines 45-57).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use atmospheric pressure as the pressure for the wet oxidation in **Chau** because **Chau** is silent to the pressure such that one of ordinary skill would use pressures known for oxidation of silicon, such at those pressures taught to be notoriously well known for pyrogenic oxidation, such as in **Yuuki**. Further in this regard, it has been held that

“Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new

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and unexpected result which is different in kind and not merely degree from the results of the prior art... such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality .... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation." *In re Aller* 105 USPQ233, 255 (CCPA 1955).

See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmischer* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sold* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934). In the instant case, the instant specification provides no evidence of criticality to the pressure at which the wet oxidation is carried out since 1 milliTorr and 760 Torr are both taught as useful pressures.

In addition to the exemplary 750 °C wet oxidation temperature, **Chau** indicates that the time depends upon both temperature and desired thickness of the oxide wherein examples of 13, 5.5 and 3 minutes are given (paragraph bridging cols. 4-5). Although **Chau** does not teach 20 to 60 seconds, the choice is obvious because a higher temperature will necessarily lead to a shorter oxidation time, as taught by **Chau** and one of ordinary skill would be motivated to use such higher temperature (e.g. up to 950 °C) and shorter time (e.g. 20 to 60 sec) to reduce the time required to form the gate dielectric. Further in this regard, there exists no evidence of record that the time is critical to the practice of the invention. (See *In re Aller*, above.)

4. Claims 13, 14, and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,066,581 (**Chivukula** et al.) in view of US Patent Application Publication 2002/0004248 A1 (**Lee** et al.) and **Van Zant**, Microchip Fabrication, 3<sup>rd</sup> ed. McGraw-Hill: New York, 1997, pp.

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149-150, and considered with the following reference **for a showing of inherency only**: CRC Handbook of Chemistry and Physics 63<sup>rd</sup> Edition, CRC Press: Boca Raton FL, pp. D-196 to D-197.

**Chivukula** discloses a method of fabricating a semiconductor device comprising the steps of

depositing a dielectric film (specifically PZT, a ferroelectric film which inherently has a dielectric constant of at least 25) --as further limited by instant claim 16-- using a sol-gel method over a semiconductor substrate to form ferroelectric films for semiconductor devices, in general, such a CMOS and RAM devices (Abstract);

subjecting the dielectric film to a densifying treatment to stabilize said dielectric film by heating the semiconductor substrate at 100 °C and then again at 350-400 °C, which removes volatile organic components prior to performing the wet oxidation on the stabilized PZT dielectric film; and

subjecting the dielectric film to a wet oxidation with steam process using a mixture comprising water, oxygen, and optionally ozone at a temperature of 450 °C to 800 °C -- as further limited by instant claim 14-- in a rapid thermal annealing (RTA) chamber for 30 seconds to several minutes to form uniform grain sizes in the ferroelectric material in a shorter time, at reduced temperature and superior characteristics during high frequency use compared to using dry oxidation and which inherently raises the oxygen content of the dielectric film (column 14, lines 27-48). (See also col. 12, lines 12-38 and col. 13, lines 5-53. See MPEP 2112.)

**Chivukula** also teaches that the steam is **carried to the reaction chamber** stating,

“Water vapour was conveniently introduced into the annealing atmosphere of the rapid thermal anneal (RTA) system during the annealing of the PZT

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by passing oxygen (O<sub>2</sub>) through a double bubbler containing purified deionized water, so that the oxygen was saturated with **water vapour**, e.g. using a gas flow rate of about 2 L/min.” (Emphasis added; Chivukula, col. 13, lines 40-46.)

**Chivukula** does not provide the amount of steam that is carried to the reaction chamber by the use of the bubbler or more specifically that it is 0.1 to 0.5 relative to the other gases.

It is held absent evidence to the contrary that the steam is present in an amount of about 0.03 (3%) or greater relative to the other gases in the chamber. Support to show inherency can be easily determined from data in the CRC Handbook at pages D-196 and D-197. The Table at the pages therein provide the vapor pressure of water as a function of temperature at temperatures below 100 °C. Because each of **Emesh** and **Chivukula** teaches that the oxygen is “saturated with water” all that need be known is the temperature of the bubbler. Even if it is assumed that bubbler is as low as standard room temperature (i.e. 25 °C), the **CRC** table of Vapor Pressure of Water Below 100 °C, indicates that the partial pressure of water is 23.756 Torr. Since atmospheric pressure is 760 Torr, the partial pressure of water in water-saturated oxygen is  $23.756/760 \approx 0.0313$  or (3.13 %). Typically bubblers are heated indicating even high partial pressures of water.

Note additionally that the oxidation is carried out in oxygen and ozone such that the amount of steam is necessarily less than 100%. While the amount of steam being 0.1 to 0.5 relative to other gases (i.e. oxygen) is not exactly taught, it would be a matter of routine optimization to select an amount of water which would given optimum results in the **Chivukula** method. In this regard, however, it has been held that these claims are *prima facie* obvious without showing that the claimed ranges achieve unexpected results relative to the prior art range. *In re Woodruff*, 16 USPQ2d 1935, 1937 (Fed. Cir. 1990). See also *In re Huang*, 40



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USPQ2d 1685, 1688(Fed. Cir. 1996)(claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result which is different in kind and not merely in degree from the results of the prior art). See also *In re Boesch*, 205 USPQ 215 (CCPA) (discovery of optimum value of result effective variable in known process is ordinarily within skill of art) and *In re Aller*, 105 USPQ 233 (CCPA 1955) (selection of optimum ranges within prior art general conditions is obvious).

Further in this regard, the specification states at p. 8, lines 18-25,

“If a mixture of H<sub>2</sub> and O<sub>2</sub> gases is used to form the steam, suitable ratios of H<sub>2</sub> gas to O<sub>2</sub> gas are in the range of about 0.1 to about 0.80... The ratio of steam relative to **other gases** in the chamber 50 **should be at least as high as 0.005**, and **preferably is in the range of about 0.1 to about 0.5**, although lesser or greater amounts also can be used.”  
(Emphasis added.)

Accordingly, the instant specification teaches away from the existence of unexpected results since **Chivukula** suggests using an amount of steam relative to the other gases that overlaps the amount that Applicant admits works properly in the instant invention.

Then the only difference is that the pressure of 1 atmosphere is not taught in **Chivukula**.

**Van Zant** teaches that atmospheric pressure can be used for wet oxidation of silicon (pp. 149-150 --especially Fig. 7.15).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use atmospheric pressure as the pressure for the wet oxidation in **Chivukula** because **Chivukula** is silent to the pressure such that one of ordinary skill would use pressures known for oxidation of silicon, such at those pressures taught to be notoriously well known in **Van Zant**.  
Further in this regard, it has been held that

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“Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art... such ranges are termed ‘critical ranges’ and the applicant has the burden of proving such criticality .... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller* 105 USPQ233, 255 (CCPA 1955).

See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmischer* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sold* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934). In the instant case, the instant specification provides no evidence of criticality to the pressure at which the wet oxidation is carried out since 1 milliTorr and 760 Torr are both taught as useful pressures.

Finally, **Chivukula** does not indicate that the PZT dielectric film is used a “part of a gate of a transistor” but does indicate that the process may be used to form ferroelectric films for semiconductor devices in general such a CMOS and RAM devices (Abstract).

**Lee** teaches that PZT film **130** may be used as “part of a gate of a transistor” and may be formed by a sol gel method (Lee; Fig. 9; paragraph [0042]).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use the method of **Chivukula** in view of **Van Zant** to form the PZT film of **Lee** because **Lee** suggests using a sol-gel method, and the method of **Chivukula** is shown to be especially beneficial at least for forming PZT at lower temperatures than conventional methods because steam annealing is used.

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5. Claims 13, 14, and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,136,728 (**Wang**) in view of US 6,114,258 (**Miner et al.**) and **Van Zant**.

Regarding independent claim 13, **Wang** discloses a method of forming a gate dielectric layer on a substrate comprising the steps of

depositing a silicon nitride film 102 --as further limited by instant claim 17-- over an active region of a semiconductor substrate to form part of a gate of a transistor (Fig. 1; col. 3, lines 16-30);

subjecting the dielectric film to a heat treatment to stabilize said dielectric film by heating the semiconductor substrate to 800 °C in an N<sub>2</sub> atmosphere for 30 minutes (Fig. 1; col. 3, lines 16-30), said heating treatment inherently densifying the silicon nitride, as admitted in the instant specification at p. 12, first paragraph and Fig. 8, wherein a 750 °C anneal is used to stabilize the deposited dielectric; and

subjecting the stabilized dielectric film to a wet oxidation with steam process **WVA** (or wet vapor anneal; Fig. 1) at temperatures greater than 450 °C (col. 5, lines 4-10) and wherein the steam is carried to the chamber (col. 3, lines 57-65).

(See also col. 5, lines 25-37.)

**Wang** does not teach that the amount of steam relative to the other gases or that the pressure is about 1 atmosphere during the steam oxidation.

**Miner** discloses a method of forming a gate dielectric layer on a substrate comprising the steps of

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depositing a silicon nitride film **105** over an active region of a semiconductor substrate **100** to from part of a gate of a transistor (col. 2, lines 20-22; col. 4, lines 31-36; Figs. 1-3); and

subjecting the dielectric film to a wet oxidation with steam process to raise the oxygen content of said dielectric film, provided by heating a mixture of hydrogen and oxygen gases in a rapid thermal process chamber at a temperature greater than 450 °C, particularly 400 °C to 1200 °C (col. 8, lines 13-32) and specific examples of 600 °C (col. 9, line 35) and 950 °C (col. 8, lines 44-56) for a period of 30 to 120 seconds (Figs. 8a-8b; col. 10, lines 3-4) --as further limited by instant claim 14-- wherein said dielectric film undergoes wet oxidation with only a mixture of hydrogen and oxygen gases that form steam. The ratio of "said mixture" (i.e. steam) relative to the other gases in the chamber overlaps the range of 0.1 to 0.5 and is therefore anticipated (col. 8, line 57 to col. 9, line 23). The pressure is potentially about atmospheric pressure at least during a detonation of the hydrogen and oxygen gases (Miner, col. 8, line 44 to line 56).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use the amount of steam and temperatures of relative to the other gases used in **Miner** to perform the wet oxidation of the silicon nitride layer of **Wang** and to use a rapid thermal process chamber because the process is faster than the furnace method used in **Wang**, and therefore beneficially reduces the thermal budget. (See Miner col. 2, lines 46-50.) As stated above the amount of steam relative to the other gases is not critical to the practice of the instant method for reasons indicated in the specification, as already noted above, particularly because the instant specification states that any ratio greater than 0.005 of steam relative to the other gases will work.

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**Van Zant** teaches that atmospheric pressure can be used for wet oxidation of silicon (pp. 149-150 --especially Fig. 7.15).

It would have been obvious for one of ordinary skill in the art, at the time of the invention to use atmospheric pressure as the pressure for the wet oxidation in **Wang** because **Wang** is silent to the pressure such that one of ordinary skill would use pressures known for oxidation of silicon, such at those pressures taught to be notoriously well known in **Van Zant**. Further in this regard, it has been held that

“Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may impart patentability to a process if the particular ranges claimed produce a new and unexpected result which is different in kind and not merely degree from the results of the prior art... such ranges are termed ‘critical ranges’ and the applicant has the burden of proving such criticality .... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” *In re Aller* 105 USPQ233, 255 (CCPA 1955).

See also *In re Waite* 77 USPQ 586 (CCPA 1948); *In re Scherl* 70 USPQ 204 (CCPA 1946); *In re Irmischer* 66 USPQ 314 (CCPA 1945); *In re Norman* 66 USPQ 308 (CCPA 1945); *In re Swenson* 56 USPQ 372 (CCPA 1942); *In re Sold* 25 USPQ 433 (CCPA 1935); *In re Dreyfus* 24 USPQ 52 (CCPA 1934). In the instant case, the instant specification provides no evidence of criticality to the pressure at which the wet oxidation is carried out since 1 milliTor and 760 Torr are both taught as useful pressures.

6. Claim 42 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 6,066,581 (**Chivukula et al.**) in view of the excerpt from the basic textbook of **Van Zant**, Microchip

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Fabrication, A Practical Guide to Semiconductor Processing, 3rd ed. McGraw-Hill: New York, 1997, pp. 157-160.

**Chivukula** discloses a method of fabricating a semiconductor device comprising the steps of

depositing a dielectric film (specifically PZT, a ferroelectric film which inherently has a dielectric constant of at least 25) over a semiconductor substrate to form a capacitor dielectric; and

subjecting the dielectric film to a wet oxidation with steam process using a mixture comprising water, oxygen, and optionally ozone at a temperature of 450 °C to 800 °C in a rapid thermal annealing (RTA) chamber for 30 seconds to several minutes to form uniform grain sizes in the ferroelectric material in a shorter time, at reduced temperature and superior characteristics during high frequency use compared to using dry oxidation and which inherently raises the oxygen content of the dielectric film (column 14, lines 27-48). (See also col. 12, lines 12-38 and col. 13, lines 5-53. See MPEP 2112.)

**Chivukula** does not teach that the water is provided by reacting hydrogen and oxygen to produce steam, but does teach that

“Water vapour was conveniently introduced into the annealing atmosphere of the rapid thermal anneal (RTA) system during the annealing of the PZT by passing oxygen (O<sub>2</sub>) through a double bubbler containing purified deionized water, so that the oxygen was saturated with water vapour, e.g. using a gas flow rate of about 2 L/min.” (Chivukula, col. 13, lines 40-46).

**Van Zant** teaches that “Dryox,” a mixture of hydrogen and oxygen gases which react to form a steam oxidizing mixture in the reactor, is preferred over liquid systems such as a bubbler,

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because the process is cleaner and more controllable and also that "Dryox is the preferred method for production of advanced devices." (See pp. 157-160 -- especially page 160.)

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use hydrogen and oxygen as taught by **Van Zant** to form the steam for the wet oxidation mixture of **Chivukula**, for the reasons indicated in **Van Zant**, as noted and especially because "Dryox" is preferred to bubblers which **Chivukula** uses.

Furthermore, the method by which the water for the wet oxidizing atmosphere is not critical according to Applicant's admissions in the instant specification. Rather, Applicant's specification teaches away from such unexpected results. Applicant teaches,

"One of several techniques can be used to provide steam to a vicinity of the insulating film. Such techniques include using a **bubbled water vapor system**, a **pyrogenic system** or a **catalytic system**, or **generating steam in the chamber *in situ***." (Emphasis added. See instant specification, page 3, lines 13-17.)

In other words, any of the presently notoriously well-known means to form the steam, which are specifically used in the art for oxidation, could be used, according to Applicant. Also note that the paragraph bridging pages 7 and 8 of Applicant's specification indicates specifically that a bubbler can be used in the instant invention.

Then the only difference is that the ratio of hydrogen to oxygen and the pressure of 1 milliTorr is not taught in **Chivukula**. However, **Chivukula** indicates that the wet oxidation is carried out in water plus oxygen and ozone (**Chivukula** at col. 13, lines 36-46). "[I]n considering the disclosure of a reference, it is proper to take into account not only specific teachings of the reference but also the inferences which one skilled in the art would reasonably be expected to draw therefrom." *In re Preda*, 401 F.2d 825, 826, 159 USPQ 342, 344 (CCPA 1968) See also *In*

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*re Lamberti*, 545 F.2d 747, 750, 192 USPQ 278, 280 (CCPA 1976). With this in mind, because **Chivukula** teaches that oxygen must be in excess of the water vapor, one of ordinary skill would know, based upon the stoichiometry of the reaction between hydrogen and oxygen to form the “Dryox” mixture containing water (as taught by **Van Zant**) that the ratio of hydrogen to oxygen must necessarily be less than or equal to about 0.67 because hydrogen reacts with oxygen in a 2 to 1 stoichiometric ratio ( $2 \text{ H}_2 + \text{O}_2 \rightarrow 2 \text{ H}_2\text{O}$ ). Otherwise, the oxygen will be depleted in the formation of water and excess hydrogen would remain, contrary to the teaching in **Chivukula**. Accordingly, one of ordinary skill would clearly recognize that using the more desirable method of “Dryox” oxidation, as taught by **Van Zant**, would necessarily require a range hydrogen to oxygen of 0.67 or less in order to achieve the mixture taught by **Chivukula** which requires excess oxygen with the water, which overlaps the claimed ratio of 0.1 to 0.8.

Finally while the pressure of 1 milliTorr is not taught in **Chivukula**, the pressure is a matter of routine optimization. The selection of the 1 milliTorr is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species. See *In re Jones*, 162 USPQ 224 (CCPA 1955)(the selection of optimum ranges within prior art general conditions is obvious) and *In re Boesch*, 205 USPQ 215 (CCPA 1980)(discovery of optimum value of result effective variable in a known process is obvious). Currently, there exists no criticality of the pressure to the practice of the instant invention since pressures as low as 1 milliTorr (0.001 Torr) and about 760 Torr can be used, according to the instant specification.



*Response to Arguments*

7. Applicant's arguments filed 11 February 2005 have been fully considered but they are not persuasive.

Applicant's arguments regarding the atmospheric pressure as related to the rejection of the claims under 35 USC 112(1) as not enabling are noted. The claims no longer presently reflect the basis for making the rejection, since *in situ* generation of steam is no longer claimed. However, it is noted that the statement relied upon by Applicant from the specification indicating that the pressure “**can**” be atmospheric pressure is **not** a teaching, nor is it the same as, the pressure being “**held**” at atmospheric pressure. Given the reasons of record showing that which occurs during reaction of hydrogen and oxygen, the pressure **cannot** be held at atmospheric under such reactive conditions that necessarily result in a detonation, i.e. a pressure wave. Accordingly, Applicant's argument is irrelevant for failing to address the reasons for which the rejection was made and further for amending the claims to remove the offending features.

While Applicant acknowledges that Van Zant teaches that the hydrogen and oxygen react to form steam *in situ*, Applicant argues that the tube of Van Zant is not a rapid thermal process chamber. Applicant is mistaken. The instant specification has absolutely no requisite for that which “rapid” means. Simply because Van Zant shows an “oxidation tube,” is no indication that the reaction is not rapid and the tube not a “rapid thermal process chamber.” Note that the wafers are **in** the tube. Moreover, it is notoriously well known that water (as steam) speeds the rate of oxidation relative to dry oxygen. Furthermore, it has been held that to be entitled to weight in method claims, the recited structure limitations therein must affect the method in a manipulative

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sense, and not amount to the mere claiming of a use of a particular structure. *Ex parte Pfeiffer*, 1962, C.D. 408 (1961).

Applicant opines that the pressures of the 0.001 Torr and 760 Torr (atmospheric pressure) are pressures for two separate embodiments and therefore critical, the former pressure of 0.001 Torr for use when reacting hydrogen and oxygen, *in situ*, to form steam. Examiner encourages Applicant to review the record in this and the parent application 09/296,835 and the child application 10/133,390. Particularly, Applicant has --contradictorily to this argument-- claimed and argued that the pressure could be 760 Torr (1 atmosphere) for *in situ* steam generation, until Examiner rejected the claims under 35 USC 112(1) for lack of enablement because the *in situ* generation of steam using hydrogen and oxygen at 760 Torr would necessarily cause an explosion. Examiner also pointed out that the instant specification taught away from the pressure of 760 Torr for *in situ* steam generation. (See, for example, the previous Office action, filed 16 November 2004.) Accordingly, the credibility of Applicant's argument is little, given that which Applicant has previously claimed and previously argued, directly contradict this argument.

The remaining arguments of Applicant are moot in view of new grounds or rejection.

### *Conclusion*

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO


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MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Erik Kielin whose telephone number is 571-272-1693. The examiner can normally be reached from 9:00 - 19:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead, Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



Erik Kielin  
Primary Examiner  
April 30, 2005